

Keyword Mnemonic in Modern Greek Language Acquisition

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Introduction to elaborative rehearsal and the keyword mnemonic

Today, the instruction and acquisition of lexis is regarded as an important aspect of language teaching. The study of vocabulary at present is perhaps the fastest growing area of second language education in terms of research output and publications. What is notably missing in the teaching of vocabulary is a systematically elaborated strategy for vocabulary acquisition that is based on the findings of linguistics and learning theory. Early experiments have yielded interesting results in connection with vocabulary retention in relation to word meaning and contextual constraints.

In psycho-linguistic research there has been an indication that whenever we are presented with new material which we must later recall, we try to integrate it with existing information. For vocabulary acquisition, this may mean that new words are presented in contexts of words already familiar to the learner and in sentences containing information relevant to an easier integration of the word with the learner's already available vocabulary. Cognitive psychologists have stressed the importance of mental elaboration, i.e. imaginative conceptual activity consisting of devising meaningful verbal contexts, using mnemonic devices, forming mental images (Ott et al., 1976: 37-48). The psychology of learning has revealed that a word is better retained the more cognitive activity is provided during learning (Schouten-Van Parreren, 1981: 227-245; Ott et al., 1976: 37-48).

Research into memory has revealed the importance of mental activity like embedding the word in the semantic network and the conceptual and lexical field it belongs to.

Craik and Lockhart (1972) found a difference in retention for two types of rehearsal: (a) maintenance rehearsal; and (b) elaborative rehearsal. The first type, maintenance rehearsal, the parrot-like repetition of items, did not cause any item to be transferred to long-term memory. Elaborative rehearsal, however, which involved taking the words and creating an elaboration of some sort, caused an enormous increase in subsequent recall. Through this elaborative rehearsal the material seemed to be transferred to long-term memory.

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In the learning of new second language material, similarity refers either to second language material already known or to first language knowledge. Thus conscious knowledge functions as an acquisition facilitator, enabling the learner to notice second language features of meaning-focused input which would otherwise be ignored. The features themselves however are acquired from their input in accordance with the learner's internal cognitive and linguistic processing faculties. Learner responses to a questionnaire (Cohen & Aphek, 1979) indicated that at least the following types of associations were being used by adult students involved in second language learning:

1. noting the structure of part of the word appearance;
2. linking the sound of a word in the native language to the sound of a word in the language being learned;
3. attending to the meaning of a part or several parts of the word;
4. creating a mental image of the word;
5. linking the word to the situation in which it appears;
6. placing the word in the topic group in which it belongs; and
7. associating some physical sensation to the word visualising the word in isolation or in a written context.

Often learners while in the process of language acquisition use combinations of these types of associations. The best known form of association is that of the keyword mnemonic. The keyword technique involves types 1, 2, 4 and 7 of the above associations. In other words the keyword is a mnemonic technique whereby the learner selects an acoustically or orthographically similar word (the keyword) whose meaning is known (the keyword is usually a short word embedded in the to-be-learned vocabulary word). The learner then forms an interactive image of the meaning of the keyword with the meaning of the new vocabulary item.

Recall of definitions from vocabulary words is facilitated when using the keyword method because:

1. the keyword is readily elicited by the vocabulary word - especially when the keyword is a salient part of the vocabulary word; and
2. the keyword/definition linkage has been solidified through a vivid interactive image.

When one is expected to produce a vocabulary word in response to its definition, the definition can be expected to elicit the interactive image, which in turn will elicit the keyword.

Summary of the study

The focus of this study was to assess whether the keyword method could be used as part of a regular teaching regime in a Greek language class. Questions to be addressed were: (a) how could the training of students in the keyword method be embedded in a classroom setting and (b) how could this method be taught to facilitate learners' memory, demonstrating to the students a strategy both for retrieval and learning which could prove a most powerful tool in vocabulary acquisition.

Two major issues were investigated and compared to previous research: (a) the applicability and effectiveness of the keyword method in a regular classroom as opposed to a "laboratory" setting; and (b) the keyword effectiveness for the acquisition of Greek unknown vocabulary items. The present study could be characterised as a longitudinal study, as it involves measurement of change over time. It entailed the collection of multiwave data and its main focus was the measurement of the change observed over time in students' word recall scores, induced by treatment intervention. The study sought to incorporate, through direct explanation, the instruction and use of two variations of the keyword mnemonic:

1. the unstructured keyword mnemonic device; and
2. the structured keyword mnemonic device

in a Year 5 Modern Greek language class, in order to determine which particular type of mnemonics was effective in group instruction within a natural school setting.

Three series of tests were administered to provide data about the three experimental conditions:

1. the free strategy recall condition (during which students used their own familiar mnemonic devices to memorise the newly introduced vocabulary items);
2. the unstructured keyword condition, in which students were required to generate an acoustically or orthographically similar word to the newly introduced item, the keyword, and form a mental image involving the new word's meaning and the keyword in interaction); and
3. the structured keyword condition in which students were provided with both keyword and interactive image in order to facilitate word recall.

Modern Greek vocabulary items were recalled with the aid of English or familiar Greek keywords. The first set of tests involved the application of the free strategy recall condition over a period of five weeks during which students were required to use no particular mnemonic strategy. The scores of a student in a single class of 25 students provided data on immediate and delayed modes of recall. A second set of six-weekly tests followed the introduction of the unstructured keyword method to the same sample of students. Finally a third set of tests followed the use of the structured keyword method.

The method involved two main sources of personal information about the students and their performances:

- (a) the Progressive Achievement Test (PAT); and
- (b) a questionnaire inquiring about father's occupation, student's date of birth and gender.

Data was also collected from the scores of a class of Year 6 students, who were tested on the free strategy recall of the same vocabulary items used in the experiment, with the Year 5 students, in order to control for word difficulty. A preliminary analysis of the data collected sought to interpret and assess the results of the univariate data, using analysis of variance procedures. The arguments were sustained by the evidence obtained and presented in graphs of the mean performances of the students in all experimental conditions over time. Differences in individuals and background characteristics were also investigated as possible factors contributing to the students' achievement in the word recall tests.

A multilevel analysis of the data collected in the immediate word recall tests was undertaken using the two level hierarchical linear model (HLM/2L), during which the magnitudes and significance of estimated effects, the reliability estimates, the variance explained at the macro and micro-level, the residual variance in the intercepts and slopes, the goodness of fit and deviance values of the various runs were examined. The analysis strategy was built up step by step, with a ten per cent level of significance because of the small size of the sample ($N=25$).

Further analyses were performed to examine the effect of the micro-level variable word difficulty (DIFF) on the word recall scores and to prove whether and to what extent this factor influenced students' performance across all strategies. Finally a series of analyses were conducted on the data collected from the forward and backward delayed recall tests. The runs executed for the exploratory analysis in search of the best fitting model for the immediate data were repeated for both immediate and delayed data.

Summary of results

The conclusion is drawn that the treatment interventions did undoubtedly have an effect on student growth. Initially the instruction of a new mnemonic device caused a drop in students' overall performance. However, after introducing individuals to the structured keyword mnemonic, students' scores increased resulting in substantial improvement in the performance trajectory. Students' performance improved with the use of the structured keyword condition particularly in the case of poorer achievers. Low scoring individuals were the ones to benefit most from the use of the structured keyword device, while high scoring students maintained their level of achievement in all three conditions. The overall level of performance attained in the structured keyword condition (STRAT3) slightly exceeded that of the free strategy recall condition (STRAT1).

However, performance in the unstructured keyword condition (STRAT2) was clearly lower than under the other conditions, bringing about a negative effect on the students' vocabulary learning. The unstructured keyword condition presented particular difficulties for students in the initial phase of its application, especially in the delayed mode of recall, in comparison to the free strategy condition and the structured keyword mnemonic, even though students were provided with longer item presentation rates. The difficulty was due to individuals having to concentrate on generating a keyword and an interactive image that would involve the newly introduced word, within a limited amount of time, which appeared to result in a cognitive overload.

According to Sweller (1990, 1994) a deeper understanding of our cognitive processes has led to the assumption that schema acquisition and automation are major learning mechanisms, which lead to expertise. Schema acquisition requires that cognitive resources be directed to learning to identify problem states and their associated moves. However, activities such as mean-ends search or mentally interrogating disparate sources of information, impose a heavy, extraneous cognitive load that interferes with schema acquisition because these activities do not emphasise the problem state and their associated moves. Instructional material can also be restructured to eliminate cognitive activities that act as impediments to learning through schema acquisition.

A heavy cognitive load is imposed when dealing with material that has a high level of element interactivity. High levels of element interactivity and their associated cognitive loads may be caused both by the intrinsic nature of the material being learned and by the method of presentation. Extraneous cognitive load is critical when dealing with intrinsically high element interactivity

materials. Learning difficulty could be a function of both the number of elements that must be learned and the number of elements that must be learned simultaneously. Complexes of elements that are irreducibly large because they consist of many connecting elements may tax our limited processing capacity and so impose a heavy cognitive load.

In a similar way, students having been introduced to the unstructured keyword technique were required to assimilate simultaneously a number of interactive elements consisting not only of the items to be learned, but also the steps and procedure of learning them. The extent to which elements interact for any given information can be estimated by counting the number of elements that must be considered simultaneously in order to learn a particular procedure. One of the elements that constitute the information, in isolation, could appear trivially simple, but could be impossible to assimilate while having to assimilate all other elements simultaneously.

Similarly, the element of thinking of or generating a keyword could be considered to be very simple, if taken in isolation. However this element interacts and needs to be assimilated simultaneously with the elements of memorising the keyword, learning the items' definitions, generating interactive images that contain the keyword and definition, and finally using the preceding information to help recall the item itself. All these elements in isolation appear simple and easy to automate, yet the fact of their having to be automated and assimilated simultaneously like a chain reaction due to their inseparable interaction, was responsible for a cognitive overload on the students. Only when the list of elements, mentioned briefly above, is fused into a single element can the information be automated and assimilated.

For some students the presentation of the material containing information on the unstructured keyword procedure was adequately expanded or subdivided into multiple elements that could be assimilated and then automated through practice. For some however, the information may have needed expanding with each element divided into more elements. Sweller (1988, 1989, 1994) goes on to add that the severe limitations of the human information processing system have consequences for the design and presentation of instructional material. When dealing with material with intrinsically high element interactivity, an instructional design that reduces unnecessary element interactivity and its associated cognitive load is critical. In considering this assumption, it is easy to understand how the structured keyword procedure facilitated learning, as a number of elements that had to be included and assimilated in the unstructured keyword method were eliminated or simplified through the provision of the keywords and the interactive images containing the keywords and item definitions in the structured keyword technique.

failure of the unstructured keyword mnemonic device (STRAT2) to produce an increment in students' performance would seem to be due to the cognitive overload brought upon the Year 5 students, which was overcome once students were provided with the necessary keywords and interactions to aid learning and memorising of the new vocabulary items in STRAT3.

Time appeared to play a crucial role in aiding the treatment effect and resulted in the improvement of students' performance in word recall, thus indicating the potential contribution of the control factor WEEK over the criterion variable (SCORE). A considerable factor retrieved in the design of the study was the distributed practice and learning achieved during the sixteen weeks of testing, which presumably contributed to increased performance. Another control factor that proved to influence the outcome variable was IMMDEL, the mode of recall utilised in the word recall tests.

Observing the drop between immediate and delayed mode of recall it is determined that IMMDEL is a decisive variable in estimating the treatment effects on students' scores. The drop in the difference of the scores between immediate and delayed recall tests observed in the unstructured keyword condition, was an indication of the effect this treatment would have on the long term memory of primary school students.

Although students' PAT test results, initially, did not testify to the existence of any observable difference between the genders, it appears that female students outperformed male students in the word-recall tests. In accordance with the multilevel analysis output, the macro-level variable SEX proved statistically significant, demonstrating that girls performed better than boys in all three conditions in both the immediate and delayed recall tests. Word knowledge (WORD) proved to be of importance in facilitating students' new vocabulary learning during the administration of all tests. Student's age (AGE) appeared to be marginally important at the ten per cent level of significance, while father's occupation (FOCC) was clearly not an important factor in influencing the outcome variable, SCORE. In summary, generating the keywords and images of the definition and keyword referent proved to hinder students' vocabulary acquisition.

Figures 1 and 2 present the curve fit of the mean scores of the immediate and delayed data respectively. An improvement in student achievement is also indicated in these Figures, where a regression line has been estimated for the curves representing performance in immediate and delayed scores respectively, over 16 weeks of testing. An increment in student mean scores is given by the trend of the regression lines, however these lines do not offer sufficient grounds to imply which variable (whether treatment intervention or time) most affected student scores.

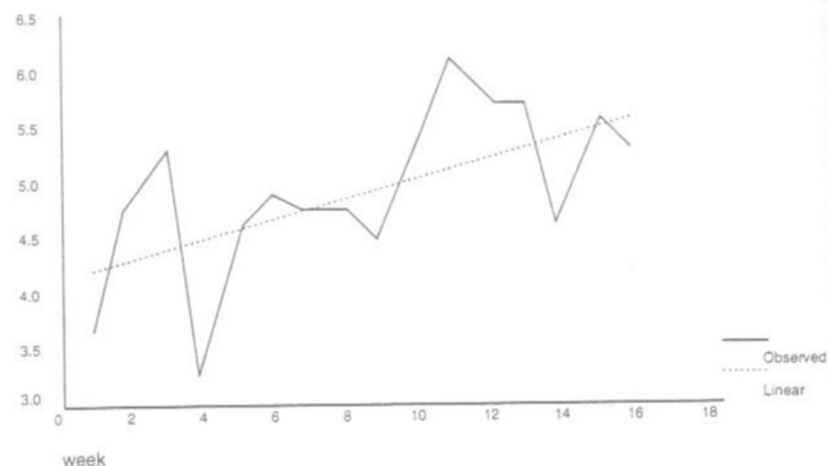


Figure 1 Curve fit of student mean scores for Immediate data over 16 weeks
Regression line is $y = 4.12 + 0.09x$, $r = 0.58$

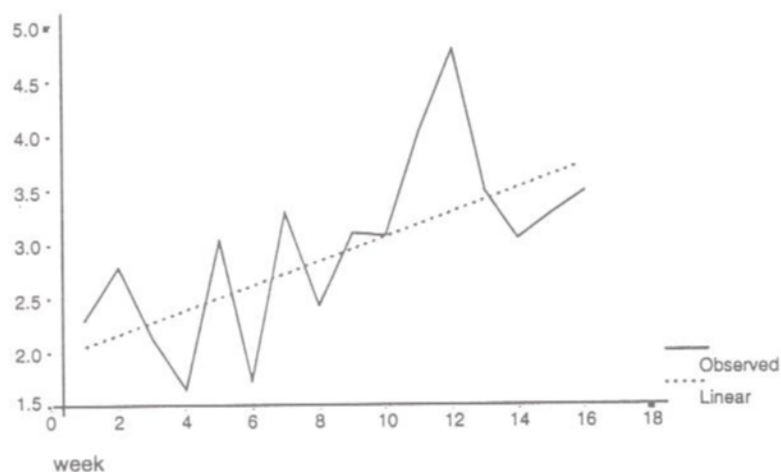


Figure 2 Curve of student mean scores for Delayed data over 16 weeks.
Regression line is $y = 2.04 + 0.11x$, $r = 0.64$

Figure 3 displays the mean scores for each condition for the immediate and delayed data per consecutive week. Here, a drop in word recall scores between the immediate and delayed tests is observed. Closer examination of the mean performances in both immediate and delayed tests shows that the difference between immediate and delayed modes of recall averaged a difference of two words per occasion, thus implying that the predictor variable IMMDEL must be included in subsequent analyses to allow for this effect.

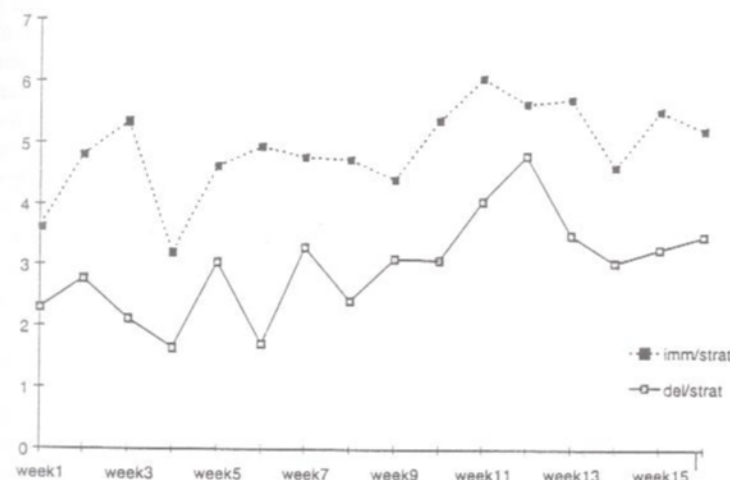


Figure 3 The mean scores of the immediate and delayed tests for all sixteen weeks (immediate mean scores are represented by the top trajectory)

Figure 4 shows that girls appeared to have out-performed boys in all three strategies. Although the student PAT test results initially did not testify to the existence of any observable difference between the genders, it was shown that female students out-performed male students in the word-recall tests. Word knowledge (WORD) proved to be of importance in enabling new vocabulary learning for students during the administration of all tests. However, when the effect of word knowledge on strategy was tested with the use of the word knowledge performance of the students, the hypothesised interaction was not

significant. It is possible that the use of a Greek word knowledge test would assist in the detection of such an interaction effect. It is also possible that with a greater number of cases this effect would be observed.

Word knowledge resulted in having a significant effect on both immediate and delayed recall tests for all experimental conditions. This shows the influence of students' verbal ability on their performance in word recall. However, word knowledge did not appear to have a significant *p* value when the unstructured and structured keyword strategies were contrasted to the free strategy recall condition in the backward recall tests. This observation contradicts the previous results obtained by analysis of the immediate and delayed recall data. The fact that verbal ability of students is no longer significant in affecting their performance, leads to the assumption that an increase in student performance in the backward recall tests under the two keyword mnemonic conditions could be attributed to the treatment intervention *per se*. In addition, the verbal ability variable measured student word knowledge in English, whereas the backward recall tests examined participant performance solely in retrieving Greek vocabulary items. Contrary to this, results obtained from the forward recall data analysis highlighted the importance of the verbal ability of students on the outcome variable. Forward recall tests examined the ability of students to retrieve the English definitions from the Greek vocabulary items. In brief, verbal ability had a significant effect on student performance in the forward recall and immediate and delayed recall tests, while it presented no significant effect on the outcome variable in the backward recall tests.

The macro-level variable student's gender proved to be statistically significant, demonstrating that girls performed better than boys in all three conditions in both the immediate and delayed recall tests. Student's age appeared to be marginally important at the 10 per cent level of significance, while father's occupation was clearly not an important factor in influencing the outcome variable, student's scores.

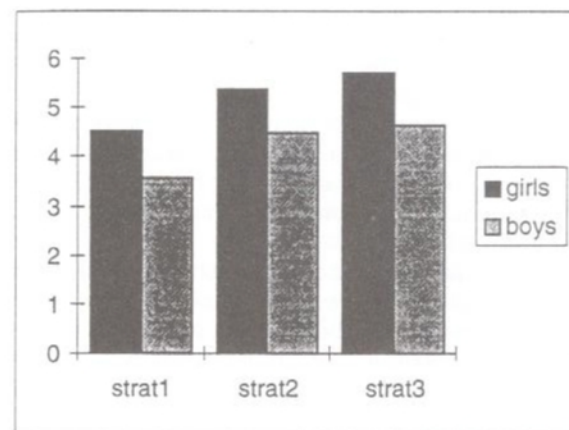


Figure 4 Mean scores in the immediate recall tests for girls and boys

The keyword mnemonic significantly facilitates recall of modern Greek (newly introduced) vocabulary. The variations of the keyword did not seem to affect the high scoring students, as they remained high achieving during all three strategies. However, even while STRAT2 caused a certain amount of difficulty in lower scoring students, high scoring students did not fluctuate in their performance. This proved that the keyword mnemonic both in its structured and unstructured form facilitated word recall in Modern Greek, and could be a strong and useful tool permitting long and short-term memory for high scoring students or students with a high verbal ability. The data collected was analysed with the aid of the hierarchical linear model (HLM/2L), during which the magnitudes and significance of estimated effects, the reliability estimates, the variance explained at the macro and micro-level, the residual variance in the intercepts and slopes, the goodness of fit and deviance values of the various runs were examined. The analysis strategy was built up step by step, with a ten per cent level of significance because of the small size of the sample ($N=25$).

Further analyses were performed to examine the effect of the micro-level variable word difficulty (DIFF) on the word recall scores and to prove whether and to what extent this factor influenced performance of students across all strategies. Finally, a series of analyses was conducted on the data collected from the forward and backward delayed recall tests. The search for the best fitting

model for the immediate data was repeated for both the immediate and delayed data taken together.

In summary, generating the keywords and images of the definition and keyword referent proved to hinder students' vocabulary acquisition. Moreover, constructing meaningful imaginal interactions within a limited amount of time was not enough to enhance learning in the unstructured keyword condition. Only when subjects were provided with the keywords and the images involving both keyword and definition, did performance reach the level obtained in the free strategy control condition. Furthermore, a marginal increase in performance was recorded.

The verbal ability examined here concerned students' knowledge in English only. In addition it would have been of particular interest to have measured students' vocabulary knowledge in the Greek language, considering participants were experienced Greek language learners and used both English and Greek keywords when practising the unstructured keyword mnemonic. This, however, is an aspect that could be examined in future studies, as there appeared to be a difficulty in finding an appropriate standardised instrument to measure Greek verbal ability. Apart from this individual characteristic other individual differences defined were: age, gender and father's occupation.

The study found that students of high verbal ability gained greater benefit from the ability-demanding variation of the keyword method, (STRAT2 or unstructured keyword) than did their lower ability peers. High ability students performed at an equally high level even when left to their own devices (free strategy condition). On the other hand, lower scoring students found the more demanding use of the unstructured keyword, where verbal ability played a decisive role in the criterion variable, initially less beneficial.

It is of interest to mention the importance of meta-cognition in the successful use of these mnemonic strategies. Students' effective use of their comprehensive knowledge in regard to specific strategy information acquired during instruction played a crucial role in improving performance. Meta-cognition used by the high scoring students contributed to their success under all conditions. In particular, the instructions and support provided during the structured keyword strategy, which comprised complete directions in the instruction condition, were more elaborate than in the unstructured keyword condition, and could thus be responsible for the improved performance observed under the structured keyword condition. As a result, students' future selection of an effective learning device over a less effective one is a special case of strategy maintenance, that is the continued use of the more effective strategy. The variable associated with maintenance of effective strategies is the meta-cognitive knowledge that a technique aids learning and recall.

The structured keyword method evokes that powerful area of meta-cognition, for what is achieved through it is to enable students to rethink what they are thinking through strategy use. The present findings are basically consistent with previous conclusions about the efficacy of associative-learning strategies in children (e.g., Levin, 1976; Pressley, 1977b; Rowher, 1973; McGivern & Levin, 1983). Thus, just as Pressley & Levin (1978) found that younger students cannot benefit as much as older students from less structured variations of the keyword method, the same could now be said of upper elementary school children who differed in one aspect of verbal ability, namely, vocabulary knowledge. However, when opportunity was given for rehearsal and practice, the unstructured keyword technique proved the most effective out of the three experimental conditions, generating the highest scores in the forward and backward delayed tests.

The keyword mnemonic significantly facilitated recall of Modern Greek (newly introduced) vocabulary. The structured keyword mnemonic facilitated word recall in Modern Greek, and could be a strong and useful tool enabling long and short-term memory for all students. The keyword employed in the variations of the keyword mnemonic apparently need not be English. The results of the current study would seem to identify some limits of the unstructured keyword method when applied to primary school students while also suggesting the strengths of the structured keyword method. The current study, however was limited in terms of the population employed, namely Year 5 students, and by the fact that it dealt only with Modern Greek language learning among Greek-Australian background students.

With the experiments mentioned in this study, two keyword mnemonic techniques were assessed on their short and long term effectiveness relative to a free strategy (non-mnemonic) condition. In each of these experiments, the retention interval (immediate versus three-day delay) was manipulated as a between-participant factor so that a relatively uncontaminated measure of long-term and short-term forgetting could be obtained. Specifically the structured keyword mnemonic proved highly effective for immediate tests of recall compared with the free strategy condition. The structured keyword technique proved to have an advantage on the immediate recall tests which remained consistent after a delayed retention interval, so that enhancing long term memory could be associated with this mnemonic learning strategy. From the results obtained following the administration of the unstructured keyword mnemonic, it was observed that the long term retention of keyword learners as opposed to the no strategy condition, was enhanced when extended practice opportunities were available. Thus both in the immediate and delayed recall tests, the mean scores increased gradually over time.

Furthermore, when allowed to practise the study items during revision, the forgetting rates of keyword learners presented an impressive improvement in performance, surpassing their scores generated in the free-strategy condition. The keyword variations improved students' performance in the delayed backward and forward recall tests and increased their achievement substantially as opposed to the free strategy condition. The unstructured keyword mnemonic proved to be the most effective treatment in enhancing the critical association between vocabulary word and definition.

The generation of memory links as opposed to having them imposed in the unstructured keyword condition would appear to have contributed to the improvement in student performance. The keyword mnemonic during the presentation and consequent revision of the items emphasised the relational encodings derived from the particular attributes that accompanied the study item. Thus, the so-called fragility of the keyword-based memories in time would appear to be overcome through repeated reinforcement, testing and rehearsal. The above results show how, only after extended practice, keyword learners may be able to generate keyword-based memories that effectively integrate the relational qualities of the items to be remembered.

The experiment conducted in the natural setting of the Year 5 language class at a private suburban primary school, is an indication that the keyword mnemonic could be successfully implemented in primary schools. In conclusion, the keyword mnemonic must be expected to produce positive, long-term benefits under conditions of repeated testing and intentional learning (McDaniel & Pressley, 1984; McDaniel, Pressley & Dunay, 1987).

Implications for classroom practice

The present results add to those from preceding studies in which the keyword mnemonic was found to improve children's memory for vocabulary acquisition (Pressley, 1977a; Pressley, Samuel, Hershey, Bispo, & Dickinson, 1981; Guttman, Levin & Pressley, 1977). In addition, the study addressed certain issues related to the practical use of the keyword method. One issue was whether this method could be effectively applied in the classroom contexts (cf. Brown & Perry, 1991). As Levin (1985) pointed out, the terms group administration and classroom implementation are not synonymous and there needs to be more evaluation of the keyword method in actual classroom settings beyond the laboratory. The present study discovered that the keyword method could be successfully implemented for the acquisition of Modern Greek vocabulary in a classroom situation. It was demonstrated that students' learning of vocabulary could be facilitated through teacher-provided imagery prompts and keywords.

Whether or not students of this age could generate effective keywords and images entirely on their own was not clear. It was noted, that it was in fact dependent on many other situational factors, such as student verbal ability (also in the L2) or the teacher-experimenter's ability to control students' attention and behaviour. However, through the practice and comparison of different mnemonic strategy variations, empirical evidence is provided for further study of the strategies' theoretically different cognitive cueing structures (Bellezza, 1981; Bower, 1972). Atkinson (1975), has argued that, in general, providing the keywords for the subjects was best. However, high scoring students did not appear to find difficulty using the unstructured keyword technique.

The results gained from the third strategy intervention demonstrated unequivocally that the keyword method could be effectively administered in the natural classroom settings. The Greek item was read and pronounced aloud by the teacher, so that the keywords provided or generated related obviously in pronunciation pattern to the foreign item and to the keyword created, thus increasing the effectiveness of the method.

The whole procedure was teacher-experimenter paced, and a separate keyword-learning tutorial phase was provided. The pacing was implemented to gain maximum control over the students' attention and study behaviour. With regard to pacing in particular Hall (1988) has found that this variable would appear to be relevant when implementing the keyword method to college students, and as a conclusion from his research he stated that the effects of the keyword method emerged only when the students were paced. However, if appropriate motivational-attentional conditions could be arranged and the components of the keyword method were understood and faithfully executed by the students, then success might be anticipated in a primary school classroom implementation of the technique.

Implications for research

The contribution of mnemonics to information-processing theory is unquestionable.

There are more applications of the keyword method, such as keyword-like techniques for learning text content (Lorayne & Lucas, 1974; Levin, 1981) and adaptations for learning taxonomic structures in the biological sciences (Vaughn, 1974). There have been other studies done on the effects of the keyword method on other aspects of learning vocabulary, such as definition associations, gender learning of nouns (Desrochers, 1980), spelling of words (Negin, 1978), recognition of multiple-syllable words by retarded children (Martin, 1978) etc.

Besides mnemonic applications, keyword research has contributed to theoretical advancement in developmental elaboration theory (Pressley, 1982;

Rowher, 1973), dual-coding theory application to second language learning (Desrochers, 1980), and developmental information processing models (Pressley & Levin, 1978). Advances in information-processing technology have led to techniques fitted for the study of organisational properties of mnemonics (e.g., Kerst, 1974; Rothstein & Atkinson, 1975; Seamon, 1972) and retrieval dynamics of elaborative versus non-elaborative mediators (Corbett, 1977). Such chronometric techniques and their implementation in a keyword context should be realisable.

Another approach to mnemonic research is Delaney's (1976) use of Markovian models showing that during multiple-trial vocabulary learning the information-processing component affected by the keyword method changes over the course of the experiment. As a result, the associations produced by the keyword condition individuals were more memorable than the meaningful encodings processed by the control condition individuals. The final outcome of all the theoretical advances reported above, as the general principles of mnemonic effectiveness are classified, is likely to be the invention of new mnemonics and the revitalisation of old mnemonic devices.

Applications of the keyword method

There has been debate on whether the keyword mnemonic interferes with correct word pronunciation. Although the current study did not deal with such an issue, opinions vary on the matter. Most believe that the keyword method may well facilitate rather than interfere with pronunciation. One reason is that the keyword method has features in common with the method of "contrasting minimal pairs" - a standard technique for teaching the phonetics of a foreign language (Atkinson, 1975). However, substantial evidence was provided during the experimental procedure in the present study, when students were observed producing and using Greek keywords rather than English keywords to facilitate recall insofar as they could thus guarantee accuracy in acoustic and spelling similarity with the new vocabulary item.

Another point to be examined is whether items learned through the keyword method take longer to recall. In Atkinson's (1975) study it was argued that some experimental results indicated that asymptotic response times were independent of the method of learning. These results reinforced experience in this present study, with the structured keyword method. Once an item has been thoroughly learned, it comes to mind immediately and rarely is the individual aware of the related keyword unless he/she makes a conscious effort to recall it.

When the structured keyword condition was used, only 15 seconds were provided to students to memorise the newly introduced items, as opposed to 30 seconds for the unstructured keyword condition and 25 seconds for the free

strategy recall condition. However, the structured keyword yielded the best results, even though when the test sheet was distributed an equal pace was maintained for all three treatments (10 minutes). During this time (10 minutes) students were required to write the word definitions and their keywords next to the newly introduced vocabulary item, in both keyword variations, whereas they were only expected to write the word meanings in the free strategy condition. Students managed to recall more items and their accompanying keywords in the structured keyword condition, than in the free strategy condition, within the same time span. The additional information required from the students in the structured keyword condition did not appear to hinder their performance in word recall: in effect, individuals had thoroughly learned the items with the aid of the structured keyword mnemonic. The evidence received from the present study indicates that the keyword strategy does not slow down or otherwise interfere with the retrieval process.

Conclusion

Today, the keyword method is one of the most extensively researched mnemonic strategies (Avila & Sadoski, 1996). It has proven most effective in improving both immediate and delayed recall of second language or foreign language vocabulary (Atkinson & Raugh, 1975; McDaniel, Pressley, & Dunay, 1987; Pressley, Levin & Delaney, 1982; Pressley, Levin & McDaniel, 1987). Levin (1989) argued that the keyword method is mnemonic-based in that it relies on the recoding, relating, and retrieving principles of effective associative mnemonic devices.

From this successful classroom application of the keyword mnemonic, it can be concluded that the keyword method and its variants deserve a role in language-learning curricula. There is proof that poorer learners received benefits when coaching was provided. A further step would be to involve students in discussions concerning the problems they confronted, to critique their images, suggest improvements or alternatives and generally offer guidance and help to perfect their skill in the use of the keyword method. The research illustrates the steps necessary to take this mnemonic method and develop it to the point that it can be used in practical teaching situations. Another step is to include teachers' own experience in learning, in order to direct them to more informative and systematic approaches to applying and succeeding with a variety of educationally relevant mnemonic strategies.

As Levin (1986) has noted, it is essential that mnemonic strategies be recognised for what they are and what they are not. In particular, mnemonic strategies are for remembering (Carney & Levin, 1993) which in turn possibly assists students in building a factual knowledge base for higher-order

applications (Levin & Levin, 1990). Mnemonic methods may not be for all students at all times, however the research evidence states that they are of use to most of the students some of the time.

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